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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/587,950	08/02/2006	Kouichi Yamaguchi	060558	6636

23850 7590 09/10/2008

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EXAMINER	
NGUYEN, VU ANH	

ART UNIT	PAPER NUMBER
1796	

MAIL DATE	DELIVERY MODE
09/10/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/587,950	YAMAGUCHI ET AL.	
	Examiner	Art Unit	
	Vu Nguyen	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08/02/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 4, 5, 7, 8, 12-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Glatkowski et al. (US 2003/0008123 A1).

3. Corresponding to the limitations set forth in these claims, Glatkowski et al. (Glatkowski, hereafter) teaches a nanocomposite dielectric comprising a polymer matrix and a plurality of carbon nanotubes (CNTs) dispersed therein (Claim 1). The amount of the carbon nanotubes is inherently between 0.0001 and 0.04 wt% relative to the resin (Figure 3; [0084] & [0107]). The polymer matrix is selected from a group that comprises epoxy resins, polyimides, fluoropolymers, urethanes, polycarbonate, polyolefin resins, and combinations thereof [0057]. It is to be noted that resins such as epoxy resins, polyimides, and urethanes are curable resins. The carbon nanotubes include single-walled (CNTs), multi-walled CNTs, or mixture thereof (Claims 2-4). Also disclosed is a mobile antenna comprising said nanocomposite dielectric [0076]. It is well known that antennas for mobile phones, GPS, and bluetooth communications systems [0075] operate in the GHz frequency ranges (see also Figure 2 and [0093]). The disclosed nanocomposite dielectric has a dielectric loss less than 0.02 (Claim 20) and the small

amount of the CNTs does not have a negative impact on the intrinsic properties of the polymer matrix [0055]. A method of minimizing dielectric loss is taught by way of preparing the disclosed nanocomposite dielectric [0068].

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claim 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glatkowski et al. (US 2003/0008123 A1) in view of Matsui et al. (WO 2000/40509).

Notes: US Pat. 6,960,334 B1 is being relied upon as English equivalence of WO 2000/40509).

7. Corresponding to the limitations set forth in claims 3 and 9, Glatkowski teaches a nanocomposite dielectric as discussed above. However, the prior art fails to specify the structure of the disclosed CNTs.

8. Matsui et al. (Matsui, hereafter) teaches a method of manufacturing amorphous nanoscale carbon tubes wherein the CNTs have the structure as recited in claim 3 (col. 3, lines 35-40). **[Motivations]** The disclosed amorphous CNTs are said to be durable for repetitive use and possess excellent mechanical, electronic, and chemical properties; and the disclosed method is said to allow mass production, in high yield and high purity, of the amorphous CNTs and enables the control of the structure and shape of the CNTs at nanoscale (col. 2, lines 17-39).

9. The examiner notes that, despite great advances made in the area of CNTs, the production of CNTs having good uniformity and high purity still encounters considerable difficulty and, as a result, CNTs of high quality are quite expensive. Consequently, in light of the benefits afforded by the method taught by Matsui, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have employed the method taught by Matsui to prepare the CNTs and used them in the nanocomposite dielectric taught by Glatkowski so as to lower the overall cost, improve the durability of the final products, and attain better control of the structure and properties of the CNTs, which, in turn, enables greater control on the properties of the nanocomposite dielectric made with such CNTs.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Glatkowski et al. (US 2003/0008123 A1).

11. Corresponding to the limitations set forth in claim 6, Glatkowski teaches a nanocomposite dielectric as discussed above. The disclosed polymer matrix “comprises

a polymer selected from one or more of the materials commonly used for electronics packaging" and includes those mentioned above [0057]. Glatkowski also teaches that specific application will dictate which polymer matrix is used [0056].

12. It is well known in the art that thermoplastic resins (such as polycarbonate) are often employed in a wide range of applications, including coatings and numerous moldings and articles. For many of these applications, superior properties in heat resistance, mechanical/chemical stability, and dimensional stability are required. Accordingly, a curable resin (such as urethanes, epoxies, polyimides) is usually incorporated in the thermoplastic resin to improve those properties. Equipped with that knowledge and in light of the suggestions made by Glatkowski, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have employed a composite resin made by dispersing a curable resin in one or more thermoplastic resins and incorporated said composite resin in the nanocomposite dielectric taught by Glatkowski to prepare electronics components that are heat resistant and have superior mechanical, chemical, and dimensional stability.

13. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glatkowski et al. (US 2003/0008123 A1) in view of Nishino et al. (US 2003/0175462 A1).

14. Regarding the limitations set forth in these claims, which depend on claim 1 and involve iron-filled CNTs and nanoflake carbon tubes, Glatkowski teaches a

nanocomposite dielectric comprising CNTs dispersed in a polymer matrix as discussed above. However, the prior art fails to teach the recited fillers.

15. Nishino et al. (Nishino, hereafter) discloses "an iron-carbon composite in which 10 to 90% of the internal space of a nanoflake carbon tube or a nested multi-walled carbon nanotube is filled with iron carbide or iron" (Abstract). **[Motivations]** Nishino also teaches that the disclosed composite can be synthesized in large quantities [0104], possesses excellent durability [0163], and, when a small amount of which is added to a resin, increases electrical conductivity and mechanical strength of the resulting articles without giving a negative impact on the transparency , hue and so forth of the resin [0166-0168]. Another important advantage of the disclosed composite is that, while the electrical properties of normal (unfilled) CNTs are dictated by the structure of the walls and controlling said structure poses a significant challenge, the electrical properties of disclosed iron-filled CNTs are dictated by the contained metal rather than by the carbon wall structure and, therefore, controlling those properties is made easier [0164-0165].

16. In light of such benefits, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified the nanocomposite dielectric taught by Glatkowski by combining the iron-filled CNTs and nanoflake carbon tubes taught by Nishino with the resins taught by Glatkowski to prepare, at a low cost, a large quantities of durable nanocomposite dielectric materials whose properties are easier to control.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vu Nguyen whose telephone number is (571)270-5454. The examiner can normally be reached on M-F 7:30-5:00 (Alternating Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Vu Nguyen
Examiner
Art Unit 1796

/David Wu/

Supervisory Patent Examiner, Art Unit 1796